U.S. Department
of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Change 10 to AIRPORT DESIGN

Date: DRAFT **AC No:** 150/5300-13
Initiated by: AAS-100 **Change:** 10

1. PURPOSE. This Change includes revisions to Chapter 1, Tables 2-1 and 2-2, Appendix 2, and Appendix 16. It also adds a new Appendix 17. Major changes include the following:

a. Added information about tail heights and a table specifying wingspan and tail heights for each Airplane Design Group to Chapter 1, paragraph 2.

b. Identified cancelled references in Chapter 1, paragraph 3.

c. Added notes to Tables 2-1 and 2-2 and changed taxiway to taxilane centerline separation for Airplane Design Group VI in Table 2-2.

d. Clarified paragraph 4a(2), "Departure Surface for Designated Runways"; moved paragraph 2e, "Glidepath Qualification Surface", to paragraph 5a; and added Glidepath Qualification Surface dimensional criteria and clarifying notes to Table A2-1 in Appendix 2. Corrected dimensions for Row 9, Columns B and C, in Table A2-1 that were erroneously changed to 700 and 1776 feet in some copies of Change 9.

e. Updated references to Appendix 2 that appear in Tables A16-1A through A16-1C in Appendix 16.

f. Added new Appendix 17, Minimum Distances Between Certain Airport Features And Any On-Airport Agriculture Crops.

g. Renumbered Appendices 17 and 18.

2. CHANGED TEXT. Changed text is indicated by vertical bars in the margins.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
1 – 2	10/1/02	1	DRAFT
		2	10/1/02
3 – 4	2/14/97	3 – 4	DRAFT
5 – 6	10/1/02	5 – 6*	10/1/02
13	9/30/00	13	9/30/00
14 – 15	9/30/00	14 – 15	DRAFT
16	11/10/94	16	11/10/94
99 – 100	9/29/89	99	9/29/89
101 – 107	9/26/05	100 – 103	DRAFT
		104 – 105*	9/26/05
		106	DRAFT
107 – 110	9/29/89	107*	9/26/05
		108 – 110*	9/29/89
291	9/30/00	291 – 294	DRAFT
292 – 294	10/01/02	295	9/30/00
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Chapter 1. REGULATORY REQUIREMENTS AND DEFINITION OF TERMS

1. GENERAL. Section 103 of the Federal Aviation Act of 1958 states in part, "In the exercise and performance of his power and duties under this Act, the Secretary of Transportation shall consider the following, among other things, as being in the public interest: (a) The regulation of air commerce in such manner as to best promote its development and safety and fulfill the requirements of defense; (b) The promotion, encouragement, and development of civil aeronautics . . . ."

This public charge, in effect, requires the development and maintenance of a national system of safe, delay-free, and cost-effective airports. The use of the standards and recommendations contained in this publication in the design of airports supports this public charge. These standards and recommendations, however, do not limit or regulate the operations of aircraft.

2. DEFINITIONS. As used in this publication, the following terms mean:

Aircraft Approach Category. A grouping of aircraft based on 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more but less than 121 knots.

Category C: Speed 121 knots or more but less than 141 knots.

Category D: Speed 141 knots or more but less than 166 knots.

Category E: Speed 166 knots or more.

Airplane Design Group (ADG). A grouping of airplanes based on wingspan and tail height. The groups are as follows:

Group I: Up to but not including 49 feet (15 m) wingspan and tail height up to but not including 20 feet.

Group II: 49 feet (15 m) up to but not including 79 feet (24 m) wingspan and tail height from 20 up to but not including 30 feet.

Group III: 79 feet (24 m) up to but not including 118 feet (36 m) wingspan and tail height from 30 up to but not including 45 feet.

Group IV: 118 feet (36 m) up to but not including 171 feet (52 m) wingspan and tail height from 45 up to but not including 60 feet.

Group V: 171 feet (52 m) up to but not including 214 feet (65 m) wingspan and tail height from 60 up to but not including 66 feet.

Group VI: 214 feet (65 m) up to but not including 262 feet (80 m) wingspan and tail height from 66 up to but not including 80 feet.

Table 1-1. Aircraft Design Groups (ADG)

Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20 - <30	49 - <79
III	30 - <45	79 - <118
IV	45 - <60	118 - <171
V	57 - <66	171 - <214
VI	66 - <80	214 - <262

Airport Elevation. The highest point on an airport's usable runway expressed in feet above mean sea level (MSL).

Airport Layout Plan (ALP). The plan of an airport showing the layout of existing and proposed airport facilities.

Airport Reference Point (ARP). The latitude and longitude of the approximate center of the airport.

Blast Fence. A barrier used to divert or dissipate jet blast or propeller wash.

Building Restriction Line (BRL). A line which identifies suitable building area locations on airports.

Clear Zone. See Runway Protection Zone.

Clearway (CWY). A defined rectangular area beyond the end of a runway cleared or suitable for use in lieu of runway to satisfy takeoff distance requirements.

Compass Calibration Pad. An airport facility used for calibrating an aircraft compass.

Declared Distances. The distances the airport owner declares available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing

distance requirements. The distances are:

Takeoff run available (TORA). The runway length declared available and suitable for the ground run of an airplane taking off;

Takeoff distance available (TODA). The TORA plus the length of any remaining runway or clearway (CWY) beyond the far end of the TORA;

Accelerate-stop distance available (ASDA). The runway plus stopway (SWY) length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff; and

Landing distance available (LDA). The runway length declared available and suitable for a landing airplane.

NOTE: The full length of TODA may not be usable for all takeoffs because of obstacles in the departure area. The usable TODA length is aircraft performance dependent and, as such, must be determined by the aircraft operator before each takeoff and requires knowledge of the location of each controlling obstacle in the departure area.

Fixed By Function NAVAID. An air navigation aid (NAVAID) that must be positioned in a particular location in order to provide an essential benefit for civil aviation is fixed by function. Exceptions are:

a. Equipment shelters, junction boxes, transformers, and other appurtenances that support a fixed by function NAVAID *are not* fixed by function unless operational requirements require them to be located in close proximity to the NAVAID.

b. Some NAVAIDs, such as localizers, can provide beneficial performance even when they are not located at their optimal location. These NAVAIDS are not fixed by function.

Frangible NAVAID. A navigational aid (NAVAID) which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft. The term NAVAID includes electrical and visual air navigational aids, lights, signs, and associated supporting equipment.

Hazard to Air Navigation. An object which, as a result of an aeronautical study, the FAA determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

Large Airplane. An airplane of more than 12,500 pounds (5 700 kg) maximum certificated takeoff weight.

Low Impact Resistant Supports (LIRS). Supports designed to resist operational and environmental static loads and fail when subjected to a shock load such as that from a colliding aircraft.

Object. Includes, but is not limited to above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA). An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle Free Zone (OFZ). The OFZ is the airspace below 150 feet (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is sub-divided as follows:

Runway OFZ. The airspace above a surface centered on the runway centerline.

Inner-approach OFZ. The airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.

Inner-transitional OFZ. The airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to runways with approach visibility minimums lower than 3/4-statute mile (1 200 m).

Obstruction to Air Navigation. An object of greater height than any of the heights or surfaces presented in Subpart C of Code of Federal Regulation (14 CFR), Part 77. (Obstructions to air navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.)

Precision Approach Category I (CAT I) Runway. A runway with an instrument approach procedure which provides for approaches to a decision height (DH) of not less than 200 feet (60 m) and visibility of not less than 1/2 mile (800 m) or Runway Visual Range (RVR) 2400 (RVR 1800 with operative touchdown zone and runway centerline lights).

Precision Approach Category II (CAT II) Runway. A runway with an instrument approach procedure which provides for approaches to a minima less than CAT I to as low as a decision height (DH) of not less than 100 feet (30 m) and RVR of not less than RVR 1200.

Precision Approach Category III (CAT III) Runway. A runway with an instrument approach procedure which provides for approaches to minima less than CAT II.

Runway (RW). A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.

Runway Blast Pad. A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

Runway Protection Zone (RPZ). An area off the runway end to enhance the protection of people and property on the ground.

Runway Safety Area (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Shoulder. An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

Small Airplane. An airplane of 12,500 pounds (5 700 kg) or less maximum certificated takeoff weight.

Stopway (SWY). A defined rectangular surface beyond the end of a runway prepared or suitable for use in lieu of runway to support an airplane, without causing structural damage to the airplane, during an aborted takeoff.

Taxilane (TL). The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

Taxiway (TW). A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Safety Area (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

Threshold (TH). The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.

Displaced Threshold. The portion of pavement behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction.

Relocated Threshold. The portion of pavement behind a relocated threshold is not available for takeoff or landing. It may be available for taxiing of aircraft.

Visual Runway. A runway without an existing or planned straight-in instrument approach procedure.

3. RELATED/REFERENCED READING MATERIAL. The following is a listing of documents referenced in other parts of this advisory circular. Advisory Circulars 00-2 and 00-44 may be obtained by writing to: The U.S. Department of Transportation; Utilization and Storage Section, M-443.2; Washington, D.C. 20590. Instructions for obtaining these publications are found in AC 00-2 and AC 00-44.

a. AC 00-2, Advisory Circular Checklist.

b. AC 00-44, Status of Federal Aviation Regulations.

c. AC 20-35, Tiedown Sense.

d. AC 70/7460-1, Obstruction Marking and Lighting.

e. AC 70/7460-2, Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace.

f. AC 107-1, Aviation Security-Airports.

g. AC 120-29, Criteria for Approving Category I and Category II Landing Minima for FAR Part 121 Operators.

h. AC 150/5000-3, Address List for Regional Airports Divisions and Airports District/Field Offices. (Cancelled)

i. AC 150/5060-5, Airport Capacity and Delay.

j. AC 150/5070-3, Planning the Airport Industrial Park.

k. AC 150/5070-6, Airport Master Plans.

l. AC 150/5190-1, Minimum Standards for Commercial Aeronautical Activities on Public Airports. (Cancelled)

m. AC 150/5190-4, A Model Zoning Ordinance to Limit Height of Objects Around Airports.

n. AC 150/5200-33, Hazardous Wildlife Attractants On or Near Airports.

o. AC 150/5220-16, Automated Weather Observing Systems (AWOS) for Non-Federal Applications.

p. AC 150/5320-4, Aircraft Fuel Storage, Handling, and Dispensing on Airports.

q. AC 150/5320-5, Airport Drainage.

r. AC 150/5320-6, Airport Pavement Design and Evaluation.

s. AC 150/5320-14, Airport Landscaping for Noise Control Purposes.

t. AC 150/5325-4, Runway Length Requirements for Airport Design.

u. AC 150/5340-1, Standards for Airport Marking.

v. AC 150/5340-5, Segmented Circle Marker Systems.

w. AC 150/5340-14, Economy Approach Lighting Aids. (Cancelled)

x. AC 150/5340-18, Standards for Airport Sign Systems.

y. AC 150/5340-21, Airport Miscellaneous Lighting Visual Aids. (Cancelled)

z. AC 150/5340-24, Runway and Taxiway Edge Lighting System. (Cancelled)

aa. AC 150/5340-28, Precision Approach Path Indicator (PAPI) Systems. (Cancelled)

bb. AC 150/5345-52, Generic Visual Slope Indicators (GVGI).

cc. AC 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities.

dd. AC 150/5370-10, Standards for Specifying Construction of Airports.

ee. AC 150/5390-2, Heliport Design.

ff. 14 CFR Part 23, Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes.

gg. 14 CFR Part 25, Airworthiness Standards: Transport Category Airplanes.

hh. 14 CFR Part 77, Objects Affecting Navigable Airspace.

ii. 14 CFR Part 97, Standard Instrument Approach Procedures.

jj. 14 CFR Part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft.

kk. 14 CFR Part 139, Certification of Airports.

ll. 14 CFR Part 151, Federal Aid to Airports.

mm. 14 CFR Part 152, Airport Aid Program.

nn. 14 CFR Part 153, Acquisition of U.S. Land for Public Airports. (Removed from Title 14)

oo. 14 CFR Part 154, Acquisition of Land for Public Airports Under the Airport and Airway Development Act of 1970. (Removed from Title 14)

pp. 14 CFR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports.

qq. Order 1050.1, Policies and Procedures for Considering Environmental Impacts.

rr. Order 5050.4, Airport Environmental Handbook.

ss. Order 5100.38, Airport Improvement Program (AIP) Handbook.

tt. Order 7400.2, Procedures for Handling Airspace Matters.

uu. Order 8200.1, United States Standard Flight Inspection Manual.

vv. Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS).

4. AIRPORT REFERENCE CODE (ARC). The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport.

a. Coding System. The airport reference code has two components relating to the airport design aircraft. The first component, depicted by a letter, is the *aircraft approach category* and relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the *airplane design group* and relates to airplane wingspan (physical characteristic). Generally, runways standards are related to aircraft approach speed, airplane wingspan, and designated or planned approach visibility minimums. Taxiway and taxilane standards are related to airplane design group.

b. Airport Design. Airport design first requires selecting the ARC(s), then the lowest designated or planned approach visibility minimums for each runway, and then applying the airport design criteria associated with the airport reference code and the designated or planned approach visibility minimums.

(1) An upgrade in the first component of the ARC may result in an increase in airport design standards. Table 1-1 depicts these increases.

(2) An upgrade in the second component of the ARC generally will result in a major increase in airport design standards.

(3) An airport upgrade to provide for lower approach visibility minimums may result in an increase in airport design standards. Table 1-2 depicts these increases.

(4) Operational minimums are based on current criteria, runways, airspace, and instrumentation. Unless this is taken into consideration in the development of the airport, the operational minimums may be other than proposed.

(5) For airports with two or more runways, it may be desirable to design all airport elements to meet the requirements of the most demanding ARC. However, it may be more practical to design some airport elements, e.g., a secondary runway and its associated taxiway, to standards associated with a lesser demanding ARC.

5. AIRPORT LAYOUT PLAN. An Airport Layout Plan (ALP) is a scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport. Any airport will benefit from a carefully developed plan that reflects current FAA design standards and planning criteria. (See appendices 6 and 7 for detailed information.)

a. FAA-Approved ALP. All airport development carried out at Federally obligated airports must be done in accordance with an FAA-approved ALP. The FAA-approved ALP, to the extent practicable, should conform to the FAA airport design standards existing at the time of its approval. Due to unique site, environmental, or other constraints, the FAA may approve an ALP not fully complying with design standards. Such approval requires an FAA study and finding that the proposed modification is safe for the specific site and conditions. When the FAA upgrades a standard, airport owners should, to the extent practicable, include the upgrade in the ALP before starting future development.

b. Guidance. AC 150/5070-6, Airport Master Plans, contains background information on the development of ALPs, as well as a detailed listing of the various components that constitute a well-appointed ALP.

c. Electronic Plans. The FAA recommends the development of electronic ALPs where practical.

6. MODIFICATION OF AIRPORT DESIGN STANDARDS TO MEET LOCAL CONDITIONS. "Modification to standards" means any change to FAA design standards other than dimensional standards for runway safety areas. Unique local conditions may require modification to airport design standards for a specific airport. A modification to an airport design standard related to new construction, reconstruction, expansion, or upgrade on an airport which received Federal aid requires FAA approval. The request for modification should show that the modification will provide an acceptable level of safety, economy, durability, and workmanship. Appendixes 8 and 9 discuss the relationship between airplane physical characteristics and the design of airport elements. This rationale along with the computer program cited in appendix 11 may be used to show that the modification will provide an acceptable level of safety for the specified conditions, including the type of aircraft.

7. NOTICE TO THE FAA OF AIRPORT DEVELOPMENT. 14 CFR Part 157, Notice of Construction, Activation, and Deactivation of Airports, requires persons proposing to construct, activate, or deactivate an airport to give notice of their intent to the FAA. The notice applies to proposed alterations to the takeoff and landing areas, traffic patterns, and airport use, e.g., a change from private-use to public-use.

a. Notice Procedure. 14 CFR Part 157 requires airport proponents to notify the appropriate FAA Airports Regional or District Office at least 30 days before construction, alteration, deactivation, or the date of the proposed change in use. In an emergency involving essential public service, health, or safety, or when delay would result in a hardship, a proponent may notify the FAA by telephone and submit Form 7480-1, Notice of Landing Area Proposal, within 5 days.

b. The Notice. The notice consists of a completed FAA Form 7480-1, a layout sketch, and a location map. The layout sketch should show the airport takeoff and landing area configuration in relation to buildings, trees, fences, power lines, and other similar significant features. The preferred type of location map is the 7.5 minute U.S. Geological Survey Quadrangle Map showing the location of the airport site. Form 7480-1 lists FAA Airports Office addresses.

c. FAA Action. The FAA evaluates the airport proposal for its impact upon the: safe and efficient use of navigable airspace; operation of air navigation facilities; existing or potential airport capacity; and safety of persons and property on the ground. The FAA notifies proponents of the results of the FAA evaluation.

d. Penalty for Failure to Provide Notice. Persons who fail to give notice are subject to civil penalty.

8. NOTICE TO THE FAA OF PROPOSED CONSTRUCTION. 14 CFR Part 77, Objects Affecting Navigable Airspace, requires persons proposing any construction or alteration described in 14 CFR Section 77.13(a) to give 30-day notice to the FAA of their intent. This includes any construction or alteration of structures more than 200 feet (61 m) in height above the ground level or at a height that penetrates defined imaginary surfaces located in the vicinity of a public-use airport.

a. Airport Data Requirements. Future airport development plans and feasibility studies on file with the FAA may influence the determinations resulting from 14 CFR Part 77 studies. To assure full consideration of future airport development in 14 CFR Part 77 studies, airport owners must have their plans on file with the FAA. The necessary plan data includes, as a minimum, planned runway end coordinates, elevation, and type of approach for any new runway or runway extension.

b. Penalty for Failure to Provide Notice. Persons who knowingly and willingly fail to give such notice are subject to criminal prosecution.

9. FAA STUDIES. The FAA studies existing and proposed objects and activities, on and in the vicinity of public-use airports. These objects and activities are not limited to obstructions to air navigation, as defined in 14 CFR Part 77. These studies focus on the efficient use of the airport and the safety of persons and property on the ground. As the result of these studies, the FAA may resist, oppose, or recommend against the presence of objects or activities in the vicinity of a public-use airport that conflict with an airport planning or design standard/recommendation. This policy is stated as a notice on page 32152 of Volume 54, No. 149, of the Federal Register, dated Friday, August 4, 1989. FAA studies conclude:

a. Whether an obstruction to air navigation is a hazard to air navigation;

b. Whether an object or activity on or in the vicinity of an airport is objectionable;

c. Whether the need to alter, remove, mark, or light an object exists;

d. Whether to approve an Airport Layout Plan;

e. Whether proposed construction, enlargement, or modification to an airport would have an adverse effect on the safe and efficient use of navigable airspace; or

f. Whether a change in an operational procedure is feasible.

10. FEDERAL ASSISTANCE. The FAA administers a grant program (per Order 5100.38, Airport Improvement Program (AIP) Handbook) which provides financial assistance for developing public-use airports. Persons interested in this program can obtain information from FAA Airports Regional or District Offices. Technical assistance in airport development is also available from these offices.

11. ENVIRONMENTAL ASSESSMENTS. Federal grant assistance in, or ALP approval of, new airport construction or major expansion normally require an environmental assessment in accordance with FAA Order 5050.4A, Airport Environmental Handbook, and the National Environmental Policy Act of 1969.

12. STATE ROLE. Many State aeronautics commissions or similar departments require prior approval and, in some instances, a license for the establishment and operation of an airport. Some States administer a financial assistance program similar to the Federal program and technical advice. Proponents should contact their respective State aeronautics commissions or departments for information on licensing and assistance programs.

13. LOCAL ROLE. Most communities have zoning ordinances, building codes, and fire regulations which may affect airport development. Some have or are in the process of developing codes or ordinances regulating environmental issues such as noise and air quality. Others may have specific procedures for establishing an airport.

14. to 199. RESERVED

a. Recommendations. Other objects which are desirable to clear, if practicable, are objects which do not have a substantial adverse effect on the airport but, if removed, will enhance operations. These include objects in the controlled activity area and obstructions to air navigation which are not covered in paragraph 211.a, especially those penetrating an approach surface. On a paved runway, the approach surface starts 200 feet (61 m) beyond the area usable for takeoff or landing, whichever is more demanding. On an unpaved runway, the approach surface starts at the end of the area usable for takeoff or landing.

212. RUNWAY PROTECTION ZONE (RPZ). The RPZ's function is to enhance the protection of people and property on the ground. This is achieved through airport owner control over RPZs. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of sufficient property interest in the RPZ.

b. Standards.

(1) RPZ Configuration/Location. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The controlled activity area and a portion of the Runway OFA are the two components of the RPZ (see Figure 2-3). The RPZ dimension for a particular runway end is a function of the type of aircraft and approach visibility minimum associated with that runway end. Table 2-4 provides standard dimensions for RPZs. Other than with a special application of declared distances, the RPZ begins 200 feet (60 m) beyond the end of the area usable for takeoff or landing. With a special application of declared distances, see Appendix 14, separate approach and departure RPZs are required for each runway end.

(a) The Runway OFA. Paragraph 307 contains the location, dimension, and clearing standards for the Runway OFA.

(b) The Controlled Activity Area. The controlled activity area is the portion of the RPZ beyond and to the sides of the Runway OFA.

(2) Land Use. In addition to the criteria specified in paragraph 211, the following land use criteria apply within the RPZ:

(a) While it is desirable to clear all objects from the RPZ, some uses are permitted, provided they do not attract wildlife (see paragraph 202.g., *Wildlife Hazards*), are outside of the Runway OFA, and do not interfere with navigational aids. Automobile parking facilities, although discouraged, may be permitted, provided the parking facilities and any associated appurtenances, in addition to meeting all of the preceding conditions, are located outside of the object free area extension (as depicted in Figure 2-3). Fuel storage facilities should not be located in the RPZ.

(b) Land uses prohibited from the RPZ are residences and places of public assembly. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Fuel storage facilities should not be located in the RPZ.

c. Recommendations. Where it is determined to be impracticable for the airport owner to acquire and plan the land uses within the entire RPZ, the RPZ land use standards have recommendation status for that portion of the RPZ not controlled by the airport owner.

d. FAA Studies of Objects and Activities in the Vicinity of Airports. The FAA policy is to protect the public investment in the national airport system. To implement this policy, the FAA studies existing and proposed objects and activities, both off and on public-use airports, with respect to their effect upon the safe and efficient use of the airports and safety of persons and property on the ground. These objects need not be obstructions to air navigation, as defined in 14 CFR Part 77. As the result of a study, the FAA may issue an advisory recommendation in opposition to the presence of any off-airport object or activity in the vicinity of a public-use airport that conflicts with an airport planning or design standard or recommendation.

213. to 299. RESERVED

Table 2-1. Runway Separation Standards for aircraft approach categories A & B

ITEM	DIM 1/	AIRPLANE DESIGN GROUP				
		I 2/	I	II	III	IV
Visual runways and runways with not lower than ¾-statute mile (1200 m) approach visibility minimums						
Runway Centerline to:						
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -				
Holdline		- Refer to Advisory Circular 150/5340-1 -				
Taxiway/Taxilane Centerline 3/	D	150 ft 45 m	225 ft 67.5 m	240 ft 72 m	300 ft 90 m	400 ft 120 m
Aircraft Parking Area	G	125 ft 37.5 m	200 ft 60 m	250 ft 75 m	400 ft 120 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -				
Runways with lower than ¾-statute mile (1200 m) approach visibility minimums 4/						
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -				
Holdline		- Refer to Advisory Circular 150/5340-1 -				
Taxiway/Taxilane Centerline 3/	D	200 ft 60 m	250 ft 75 m	300 ft 90 m	350 ft 105 m	400 ft 120 m
Aircraft Parking Area	G	400 ft 120 m	400 ft 120 m	400 ft 120 m	400 ft 120 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -				

1/ Letters correspond to the dimensions on Figure 2-1.

2/ These dimensional standards pertain to facilities for small airplanes exclusively.

3/ The taxiway/taxilane centerline separation standards are for sea level. At higher elevations, an increase to these separation distances may be required to keep taxiing and holding airplanes clear of the OFZ (refer to paragraph 206).

4/ For approaches with visibility less than ½-statute miles, separation increases to 400 feet (120 m).

Table 2-2. Runway Separation Standards for aircraft approach categories C & D

ITEM	DIM 1/	AIRPLANE DESIGN GROUP					
		I	II	III	IV	V	VI
Visual runways and runways with not lower than ¾-statute mile (1 200 m) approach visibility minimums							
Runway Centerline to:							
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -					
Holdline		- Refer to Advisory Circular 150/5340-1 -					
Taxiway/Taxilane Centerline 2/	D	300 ft 90 m	300 ft 90 m	400 ft 120 m	400 ft 120 m	3/ 3/	500 ft 150 m
Aircraft Parking Area	G	400 ft 120 m	400 ft 120 m	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -					
Runways with lower than ¾-statute mile (1200 m) approach visibility minimums							
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -					
Holdline		- Refer to Advisory Circular 150/5340-1 -					
Taxiway/Taxilane Centerline 2/	D	400 ft 120 m	400 ft 120 m	400 ft 120 m	400 ft 120 m	3/ 4/ 3/ 4/	5/ 5/
Aircraft Parking Area	G	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -					

1/ Letters correspond to the dimensions on Figure 2-1.

2/ The taxiway/taxilane centerline separation standards are for sea level. At higher elevations, an increase to these separation distances may be required to keep taxiing and holding airplanes clear of the OFZ (refer to paragraph 206).

3/ For Airplane Design Group V, the standard runway centerline to parallel taxiway centerline separation distance is 400 ft (120 m) for airports at or below an elevation of 1,345 feet (410 m); 450 feet (135 m) for airports between elevations of 1,345 feet (410 m) and 6,560 feet 2 000 m); and 500 feet (150 m) for airports above an elevation of 6,560 feet (2 000 m).

4/ For approaches with visibility less than ½-statute mile, the separation distance increases to 500 feet (150 m) plus required elevation adjustment.

5/ For approaches with visibility down to ½-statute mile, the separation distance increases to 500 feet (150 m) plus elevation adjustment. For approaches with visibility less than ½-statute mile, the separation distance increases to 550 feet (168 m) plusrequired elevation adjustment.

Table 2-3. Taxiway and taxilane separation standards

ITEM	DIM 1/	AIRPLANE DESIGN GROUP					
		I	II	III	IV	V	VI
Taxiway Centerline to:							
Parallel Taxiway/ Taxilane Centerline	J	69 ft 21 m	105 ft 32 m	152 ft 46.5 m	215 ft 65.5 m	267 ft 81 m	324 ft 99 m
Fixed or Movable Object 2 and 3/	K	44.5 ft 13.5 m	65.5 ft 20 m	93 ft 28.5 m	129.5 ft 39.5 m	160 ft 48.5 m	193 ft 59 m
Taxilane Centerline to:							
Parallel Taxilane Centerline		64 ft 195. m	97 ft 29.5 m	140 ft 42.5 m	198 ft 60 m	245 ft 74.5 m	298 ft 91 m
Fixed or Movable Object 2 and 3/		39.5 ft 12 m	57.5 ft 17.5 m	81 ft 24.5 m	112.5 ft 34 m	138 ft 42 m	167 ft 51 m

1/ Letters correspond to the dimensions on Figure 2-1.

2/ This value also applies to the edge of service and maintenance roads.

3/ Consideration of the engine exhaust wake impacted from turning aircraft should be given to objects located near runway/taxiway/taxilane intersections.

The values obtained from the following equations may be used to show that a modification of standards will provide an acceptable level of safety. Refer to paragraph 6 for guidance on modification of standard requirements.

Taxiway centerline to parallel taxiway/taxilane centerline equals 1.2 times airplane wingspan plus 10 feet (3 m).

Taxiway centerline to fixed or movable object equals 0.7 times airplane wingspan plus 10 feet (3 m).

Taxilane centerline to parallel taxilane centerline equals 1.1 times airplane wingspan plus 10 feet (3 m).

Taxilane centerline to fixed or movable object equals 0.6 times airplane wingspan plus 10 feet (3 m).

```
E51: 'AREA NOT INCLUDED
A52: +A2
COPY CELL A52 TO RANGE(A52..A54)
D52: +D2
COPY CELL D52 TO RANGE(D53..E54)
A57: +A7
E57: +E7
B58: (A9+B8)/2
COPY CELL B58 TO RANGE(B58..J58)
B59: (B9+C8)/2
COPY CELL B59 TO RANGE(B59..J59)
A61: +A11
COPY CELL A61 TO RANGE(A61..A96)
B61: @IF($K61<=B$58,1,@IF($L61>B$59,$A$9,(B$59^2-$K61*$L61+
     @IF($K61<B$59,0,$L61*($K61-B$59)^2/($K61-$L61))-
     @IF($L61>B$58,0,$K61*(B$58-$L61)^2/($K61-$L61)))/(B$59^2-B$58^2)))
COPY CELL B61 TO RANGE(B61..J96)
K61: @MAX($D$4/(@MAX(@ABS(@SIN(($D$3-A61*10+5)*@PI/180)),1.0000000E-50)),
     $D$4/(@MAX(@ABS(@SIN(($D$3-A61*10-5)*@PI/180)),1.0000000E-50)))
COPY CELL K61 TO RANGE(K61..K96)
L61: @MIN($D$4/(@MAX(@ABS(@SIN(($D$3-A61*10+5)*@PI/180)),1.0000000E-50)),
     $D$4/(@MAX(@ABS(@SIN(($D$3-A61*10-5)*@PI/180)),1.0000000E-50)))
COPY CELL L61 TO RANGE(L61..L96)
A100: |::
E101: '% WIND NOT COVERED
A102: +A2
COPY CELL A102 TO RANGE(A102..A104)
D102: +D2
COPY CELL D102 TO RANGE(D103..E104)
A107: +A7
E107: +E7
L107: 'TOTAL:
B108: +B58
COPY CELL B108 TO RANGE(B108..J109)
A111: +A61
COPY CELL A111 TO RANGE(A111..A146)
B111: @IF(B61=0,$A$9,100*(B61*B11)/$K$48)
COPY CELL B111 TO RANGE(B111..J146)
L111: @SUM(B111..J111)
COPY CELL L111 TO RANGE(L111..L146)
A148: 'TOTAL:
B148: @SUM(B111..B146)
COPY CELL B148 TO RANGE(B148..J148)
L148: @SUM(L111..L146)
A150: |::
```

Figure A1-11. Lotus cell-formulas page 2

Appendix 2. RUNWAY END SITING REQUIREMENTS

1. PURPOSE. This appendix contains guidance on siting thresholds to meet approach obstacle clearance requirements and departure obstacle clearance requirements.

2. APPLICATION.

a. The threshold should be located at the beginning of the full-strength runway pavement or runway surface. However, displacement of the threshold may be required when an object that obstructs the airspace required for landing and/or departing airplanes is beyond the airport owner's power to remove, relocate, or lower. Thresholds may also be displaced for environmental considerations, such as noise abatement, or to provide the standard RSA and ROFA lengths.

b. When a hazard to air navigation exists, the amount of displacement of the threshold or reduction of the TORA should be based on the operational requirements of the most demanding airplanes. The standards in this appendix minimize the loss of operational use of the established runway and reflect the FAA policy of maximum utilization and retention of existing paved areas on airports.

c. Displacement of a threshold reduces the length of runway available for landings. Depending on the reason for displacement of the threshold, the portion of the runway behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction. Refer to Appendix 14, Declared Distances, for additional information.

d. Where specifically noted, the Glidepath Angle (GPA) and Threshold Crossing Height (TCH) of a vertically guided approach may be altered (usually increased) rather than displacing the threshold. Examples of approaches with positive vertical guidance include Instrument Landing System (ILS), Microwave Landing System (MLS), Localizer Performance with Vertical Guidance (LPV), Lateral Navigation/Vertical Navigation (LNAV/VNAV), and required navigation performance (RNP)). Alternatively, a combination of threshold displacement and altering of the Glidepath Angle/ Threshold Crossing Height (GPA/TCH) may also be accomplished. Guidelines for maximum and minimum values of TCH and GPA are contained in FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS).* The tradeoff between threshold displacement, TCH, and GPA is complex, but can be analyzed by applying formula contained in the order. Contact the appropriate FAA Airports Regional or District Office for assistance on the specific requirements and effects of GPA and TCH changes.

3. LIMITATIONS.

a. These standards should not be interpreted as an FAA blanket endorsement of the alternative to displace or relocate a runway threshold. Threshold displacement or relocation should be undertaken only after a full evaluation reveals that displacement or relocation is the only practical alternative.

b. The standards in this appendix are not applicable for identifying objects affecting navigable airspace. See Title 14 Code of Federal Regulations Part 77, Objects Affecting Navigable Airspace.

4. EVALUATION CONSIDERATIONS.

a. Possible Actions. When a penetration to a surface defined in paragraph 5 exists, one or more of the following actions are required:

(1) Approach Surfaces.

(a) The object is removed or lowered to preclude penetration of applicable threshold siting surfaces;

(b) The threshold is displaced to preclude object penetration of applicable threshold siting surfaces, with a resulting shorter landing distance; or

(c) The GPA and/or TCH is/are modified, or a combination of threshold displacement and GPA/TCH increase is accomplished.

(d) Visibility minimums are raised.

(e) Night operations are prohibited unless the obstruction is lighted or an approved Visual Glide Slope Indicator (VGSI) is used.

(2) Departure Surfaces for Designated Runways. The applicability of the surface defined in Table A2-1 is dependant on the designation of primary runway(s) for departure. The Airport Sponsor, through the Airports District Office to the Regional Airspace Procedures Team (RAPT), will identify runway end(s) intended primarily for instrument departures. The determination of primary runway(s) for departure does not prohibit or negate the use of other runways. It only identifies the applicability of the surface in Table A2-1 to the runway end(s).

(a) Remove, relocate, or lower (or both relocate and lower) the object to preclude penetration of applicable siting surfaces unless it is fixed by function

and/or designated impracticable. Within 6000' of the Table A2-1 surface origin, objects less than or equal to an elevation determined by application of the formula below are allowable.

E + (0.025 x D)

Where:
E = DER elevation
D = Distance from OCS origin to object in feet

(b) Decrease the Takeoff Distance Available (TODA) to preclude object penetration of applicable siting surfaces, with a resulting shorter takeoff distance (the Departure End of the Runway (DER) is coincident with the end of the TODA where a clearway is not in effect); or

(c) Modify instrument departures. Contact the Flight Procedures Office (FPO) for guidance. Objects penetrating by ≤ 35 feet may not require actions (a) or (b); however, they will impact departure minimums/climb gradients or departure procedures.

b. Relevant Factors for Evaluation.

(1) Types of airplanes that will use the runway and their performance characteristics.

(2) Operational disadvantages associated with accepting higher landing/ takeoff minimums.

(3) Cost of removing, relocating, or lowering the object.

(4) Effect of the reduced available landing/takeoff length when the runway is wet or icy.

(5) Cost of extending the runway if insufficient runway length would remain as a result of displacing the threshold. The environmental aspects of a runway extension need to also be evaluated under this consideration.

(6) Cost and feasibility of relocating visual and electronic approach aids, such as threshold lights, visual glide slope indicator, runway end identification lights, localizer, glide slope (to provide a threshold crossing height of not more than 60 feet (18 m)), approach lighting system, and runway markings.

(7) Effect of the threshold change on noise abatement.

5. CLEARANCE REQUIREMENTS. The standard shape, dimensions, and slope of the surface used for locating a threshold are dependent upon the type of aircraft operations currently conducted or forecasted, the landing visibility minimums desired, and the types of instrumentation available or planned for that runway end.

a. Approaches with Positive Vertical Guidance. Table A2-1 and Figure A2-1 describe the clearance surfaces required for instrument approach procedures with vertical guidance.

The Glidepath Qualification Surface (GQS) limits the height of obstructions between Decision Altitude (DA) and runway threshold (RWT). When obstructions exceed the height of the GQS, an approach procedure with positive vertical guidance is not authorized. Further information can be found in the appropriate TERPS criterion.

b. Instrument Approach Procedures Aligned with the Runway Centerline. Table A2-1 and Figure A2-1 describe the minimum clearance surfaces required for instrument approach procedures aligned with the runway centerline.

c. Procedures Not Aligned with the Runway Centerline. To accommodate for offset procedures, increase the lateral width at threshold by multiplying the width specified in the appropriate paragraph by 2 (offset side only). The outside offset boundary splays from this point at an angle equal to the amount of angular divergence between the final approach course and runway centerline + 10 degrees. Extend the outside offset boundary out to the distance specified in the applicable paragraph and connect it to runway centerline with an arc of the same radius. On the side opposite the offset, construct the area aligned with runway centerline as indicated (non-offset side only). The surface slope is as specified in the applicable paragraph, according to Table A2-1.

d. Locating or Determining the DER. The standard shape, dimensions, and slope of the departure surface used for determining the DER, as defined in TERPS, is only dependent upon whether or not instrument departures are being used or planned for that runway end. See Table A2-1 and Figures A2-1 and A2-2 for dimensions.

Subparagraph 5d(2) applies only to runways supporting Air Carrier departures and is not to be considered a clearance surface.

(1) For Departure Ends at Designated Runways.

(a) No object should penetrate a surface beginning at the elevation of the runway at the DER or end of clearway, and slopes at 40:1. Penetrations by existing obstacles of 35 feet or less would not require TODA

reduction or other mitigations found in paragraph 4; however, they may affect new or existing departure procedures.

(2) Departure Runway Ends Supporting Air Carrier Operations.

(a) Objects should be identified that penetrate a one-engine inoperative (OEI) obstacle identification surface (OIS) starting at the DER and at the elevation of the runway at that point, and slopes upward at 62.5:1. See Figure A2-4.

Note: This surface is for provided for information only and does not take effect until January 1, 2008.

Table A2-1. Approach/Departure Requirements Table

	Runway Type	DIMENSIONAL STANDARDS* Feet					Slope
		A	B	C	D	E	
1	Approach end of runways expected to serve small airplanes with approach speeds less than 50 knots. (Visual runways only, day/night)	0	60	150	500	2,500	15:1
2	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. (Visual runways only, day/night)	0	125	350	2,250	2,750	20:1
3	Approach end of runways expected to serve large airplanes (Visual day/night); or instrument minimums ≥ 1 statute mile (day only).	0	200	500	1,500	8,500	20:1
4	Approach end of runways expected to support instrument night circling. [1]	200	200	1,700	10,000	0	20:1
5	Approach end of runways expected to support instrument straight in night operations, serving approach category A and B aircraft only. [1]	200	200	1,900	10,000 [2]	0	20:1
6	Approach end of runways expected to support instrument straight in night operations serving greater than approach category B aircraft. [1]	200	400	1,900	10,000 [2]	0	20:1
7 [3, 6]	Approach end of runways expected to accommodate approaches with positive vertical guidance (GQS).	0	½ width runway + 100	760	10,000 [2]	0	30:1
8	Approach end of runways expected to accommodate instrument approaches having visibility minimums ≥ 3/4 but < 1 statute mile, day or night.	200	400	1,900	10,000 [2]	0	20:1
9	Approach end of runways expected to accommodate instrument approaches having visibility minimums < 3/4 statute mile or precision approach (ILS, GLS, or MLS), day or night.	200	400	1,900	10,000 [2]	0	34:1
10	Approach runway ends having Category II approach minimums or greater.	The criteria are set forth in TERPS, Order 8260.3.					
11	Departure runway ends for all instrument operations.	0 [4]	See Figure A2-3				40:1
12	Departure runway ends supporting Air Carrier operations. [5]	0 [4]	See Figure A2-4				62.5:1

***** The letters are keyed to those shown in Figure A2-1.

Notes:

1. Lighting of obstacle penetrations to this surface or the use of a VGSI, as defined by the TERPS order, may avoid displacing the threshold.
2. 10,000 feet is a nominal value for planning purposes. The actual length of these areas is dependent upon the visual descent point position for 20:1 and 34:1 and DA point for the 30:1.
3. Any penetration to this surface will limit the runway end to nonprecision approaches. No vertical approaches will be authorized until the penetration(s) is/are removed except obstacles fixed by function and/or allowable grading.
4. Dimension A is measured relative to DER or TODA (to include clearway).
5. Information concerning penetrations to this surface is provided for information only and does not take effect until January 1, 2008.
6. Surface dimensions/OCS slope represent a nominal approach with 3 degree GPA, 50 TCH, < 500' HAT. For specific cases refer to TERPS.

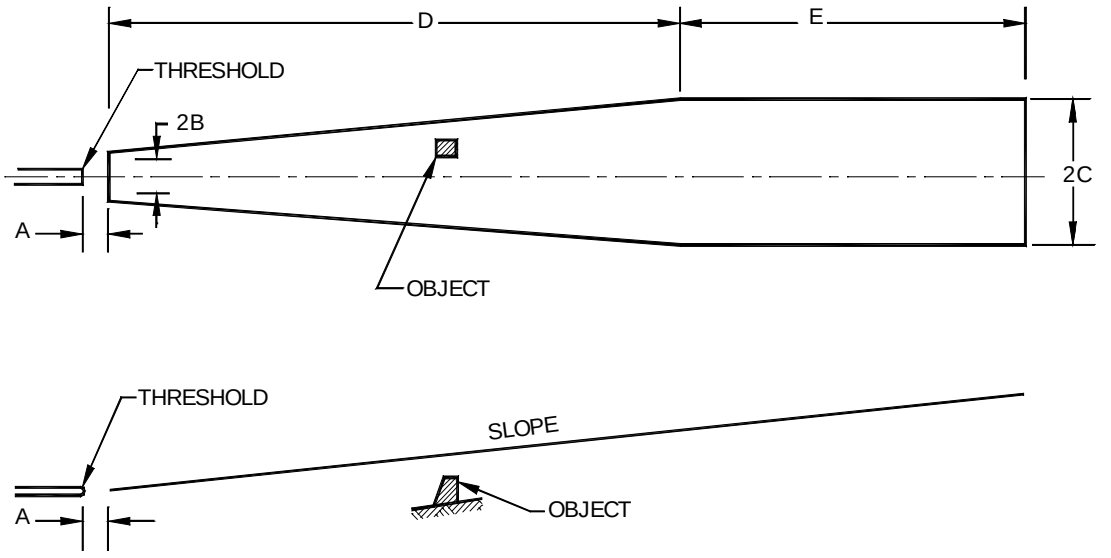

Figure A2-1. Approach slopes

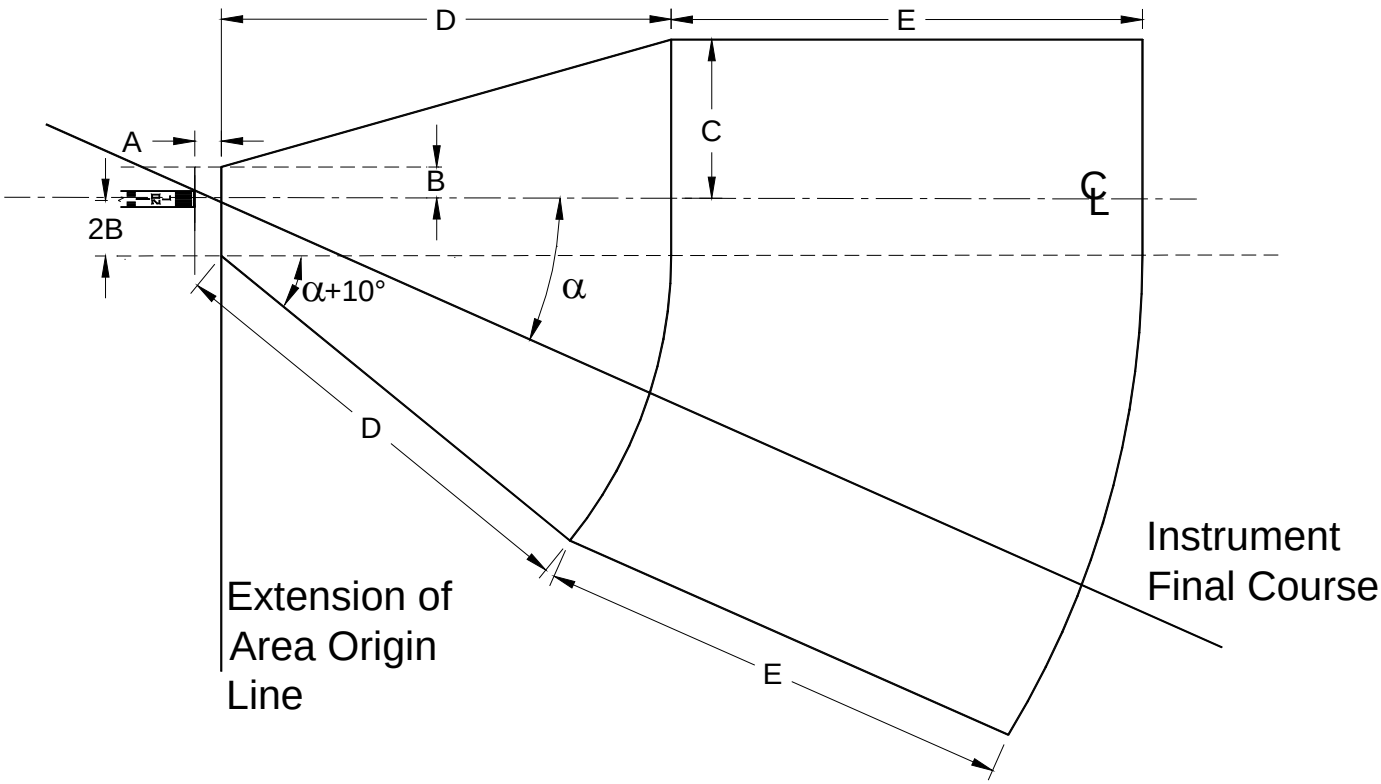

Figure A2-2. Approach Slopes—With Offset Approach Course

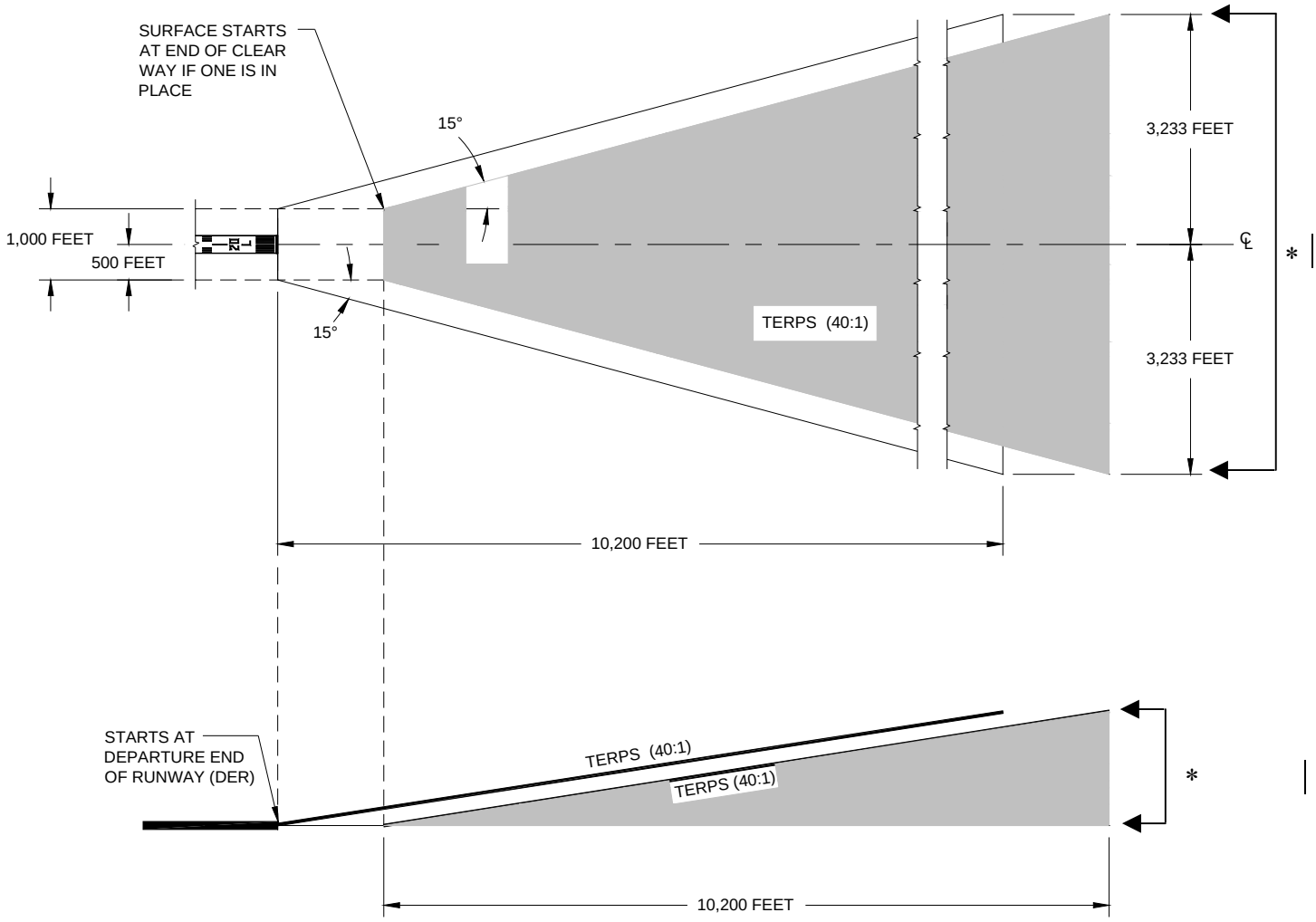

Figure A2-3. Departure surface for Instrument Runways TERPS (40:1)

* This is an interpretation of the application of the TERPS surface associated with a clearway.

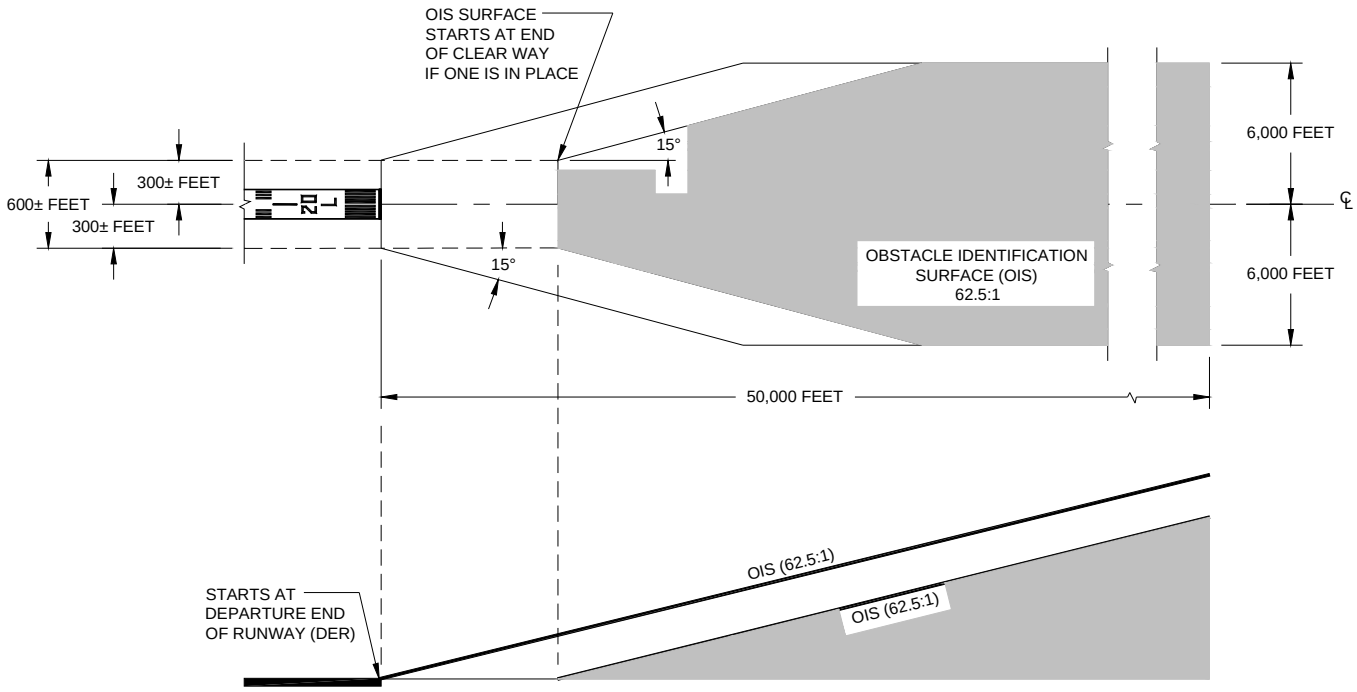

Figure A2-4. One-Engine Inoperative (OEI) Obstacle Identification Surface (62.5:1)

Appendix 3. AIRPORT REFERENCE POINT

1. **DISCUSSION**.

a. The airport reference point (ARP) geographically locates the airport horizontally. The ARP is normally not monumented or physically marked on the ground. The computation of this point uses only runway length.

b. Meaningful airport reference point computations use the ultimate runway lengths proposed for development. These computations do not use closed or abandoned areas. The FAA approved airport layout plan shows the ultimate development. If there is no airport layout plan, the ultimate runway lengths are the existing runways plus those which have airspace approval, less closed or abandoned areas.

c. The ARP is computed or recomputed as infrequently as possible. The only time that a recomputation is needed is when the proposed ultimate development is changed.

2. **SAMPLE COMPUTATION**. The following procedure determines the location of the airport reference point used in FAR Part 77 studies.

a. Establish two base lines perpendicular to each other as shown in Figure A3-1. Let the northerly base line be known as B and the westerly as A.

b. Establish the midpoint of each runway.

c. Determine the perpendicular distance from the base lines to the midpoints.

d. Calculate the moment of areas for each base line as shown in Figure A3-2.

e. Divide each moment of area by the sum of areas to determine distance of the ARP from each base line.

f. The location is converted into latitude and longitude.

3. **ACCURACY**. The latitude and longitude should be to the nearest second. Installation of navigational aids may need coordinates to the nearest tenth of a second. Coordinate with the appropriate FAA Airway Facilities field office to ascertain the need for accuracy closer than the nearest second.

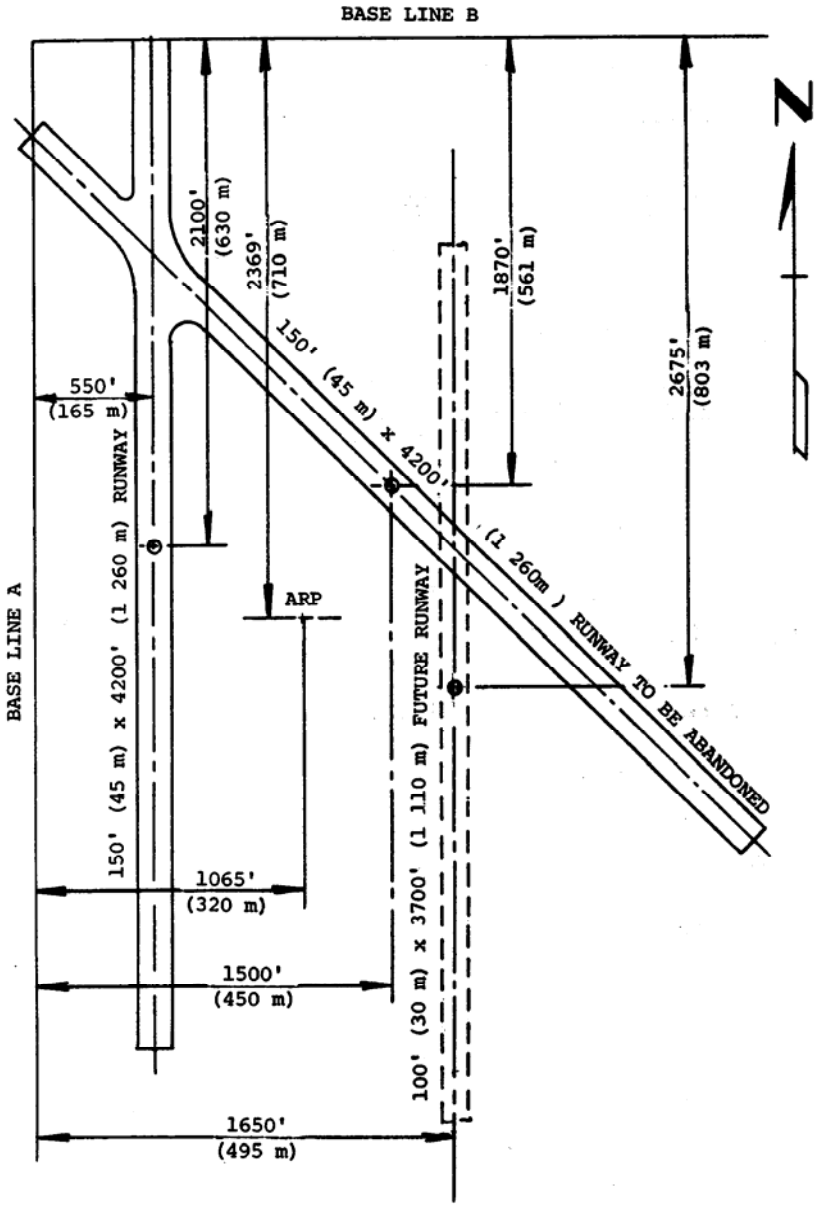

Figure A3-1. Sample layout

U.S. Customary Units

BASE LINE A:

4,200	x	550	=	2,310,000
3,700	x	1,650	=	6,105,000
7,900				8,415,000

$$= \frac{8,415,000}{7,900} = 1,065'$$

BASE LINE B:

4,200	x	2,100	=	8,820,000
3,700	x	2,675	=	9,897,500
7,900				18,717,500

$$= \frac{18,717,500}{7,900} = 2,369'$$

Metric Units

BASE LINE A:

1 266	x	165	=	207 900
1 110	x	495	=	549 450
2 370				757 350

$$= \frac{757\ 350}{2\ 370} = 320 \text{ m}$$

BASE LINE B:

1 266	x	630	=	793 800
1 110	x	803	=	891 330
2 370				1 685 130

$$= \frac{1\ 685\ 130}{2\ 370} = 710 \text{ m}$$

Note: Since the diagonal runway is to be abandoned, it is not used in the computation.

Figure A3-2. Sample computation – airport reference point

Appendix 16. NEW INSTRUMENT APPROACH PROCEDURES

1. BACKGROUND. This appendix applies to the establishment of new authorized instrument approach procedures. For purposes of this appendix, an Instrument Approach Procedure (IAP) amendment or the establishment of a Global Positioning System (GPS) instrument procedure "overlaying" an existing authorized instrument procedure does not constitute a new procedure. However, a significant reduction in minima(i.e. ¼ mile reduction in visibility and/or 50 foot reduction in decision altitude or minimum descent altitude) would constitute a new procedure.

a. This appendix identifies airport landing surface requirements to assist airport sponsors in their evaluation and preparation of the airport landing surface to support new instrument approach procedures. It also lists the airport data provided by the procedure sponsor that the FAA needs to conduct the airport airspace analysis specified in FAA Order 7400.2, *Procedures for Handling Airspace Matters*. The airport must be acceptable for IFR operations based on an Airport Airspace Analysis (AAA), under FAA Order 7400.2.

b. FAA Order 8260, *TERPS*, reflects the contents of this appendix as the minimum airport landing surface requirements that must be met prior to the establishment of instrument approach procedures at a public use airport. This order also references other FAA requirements, such as a safety analysis to determine the need for approach lighting and other visual enhancements to mitigate the effects of a difficult approach environment. This is a consideration regardless of whether or not a reduction in approach minimums is desired. Airport sponsors are always encouraged to consider an approach lighting system to enhance the safety of an instrument procedure. In the absence of any identified benefits or safety enhancement from an approach light system, sponsors should at least consider installing lower cost visual guidance aids such as REIL or PAPI.

c. The tables provided in this appendix are for planning purposes only and should be used in conjunction with the rest of the document. All pertinent requirements within this AC and other FAA documents, as well as local siting conditions, ultimately will determine the lowest minimums obtainable.

2. INTRODUCTION. To be authorized a new instrument approach procedure, the runway must have an instrument runway designation. Instrument runways are runway end specific. The runway end designation is based on the findings of an AAA study (Refer to Order 7400.2). In addition, the instrument runway designation for the desired minimums must be depicted on the FAA-approved ALP. If not depicted, a change to the ALP is required. As part of the ALP approval process, the FAA will conduct an AAA study to determine the runway's acceptability for the desired minimums.

3. ACTION. The airport landing surface must meet the standards specified in tables A16-1 A through C, for each specified runway, direction and have adequate airspace to support the instrument approach procedure. When requesting an instrument procedure, the sponsor must specify the runway direction, the desired approach minimums, whether circling approach procedures are desired, and the survey needed to support the procedure. For all obligated National Plan of Integrated Airport Systems (NPIAS) airports, the sponsor must also provide a copy of the FAA-approved ALP showing the instrument procedure(s) requested. An ALP is also recommended for all other airports.

4. DEFINITIONS.

a. Precision Approach. An instrument approach procedure providing course and vertical path guidance conforming to ILS, or MLS, precision system performance standards contained in ICAO annex 10. Table A16-1A defines the requirements for ILS, LAAS, WAAS, MLS, and other precision systems.

b. Approach Procedure with Vertical Guidance (APV). An instrument approach procedure providing course and vertical path guidance that does not conform to ILS or MLS system performance standards contained in ICAO annex 10, or a precision approach system that does not meet TERPS alignment criteria. Table A16-1B defines the requirements for WAAS and authorized barometric VNAV.

c. Nonprecision Approach. An instrument approach procedure providing course guidance without vertical path guidance. Table A16-3C defines the requirements for VOR, NDB, LDA, GPS (TS0-129) or other authorized RNAV system.

Table A16-1A. Precision Instrument Approach Requirements.

Visibility Minimums[1]	<3/4 statute mile	< 1-statute mile
Height Above Touchdown (HAT)[2]	200	
TERPS Glidepath Qualification Surface (GQS)[3]	Table A2-1, Row 7, Criteria, and Appendix 2, par. 5a Clear	
TERPS precision "W" surfaces [4]	Clear	See Note 5
TERPS Paragraph 251	34:1 Clear	20:1 Clear
Precision Obstacle Free Zone (POFZ) 200 x 800[6]	Required	Not Required
Airport Layout Plan[7]	Required	
Minimum Runway Length	4,200 ft (1,280 m) (Paved)	
Runway Markings (See AC 150/5340-1)	Precision	Nonprecision
Holding Position Signs & Markings (See AC 150/5340-1 and AC 150/5340-18)	Precision	Nonprecision
Runway Edge Lights[8]	HIRL / MIRL	
Parallel Taxiway [9]	Required	
Approach Lights[10]	MALSR, SSALR, or ALSF	Recommended
Runway Design Standards; e.g., Obstacle Free Zone (OFZ) [11]	< 3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums
Threshold Siting Criteria To Be Met [12]	Table A2-1, Row 9, Criteria	Table A2-1, Row 8, Criteria
Survey Required for Lowest Minima (See Table A16-2)	Table A2-1, Row 10, Criteria	Table A2-1, Row 9, Criteria

1. Visibility minimums are subject to application of FAA Order 8260.3 (TERPS) and associated orders or this table, whichever are higher.
2. The HAT indicated is for planning purposes only. Actual obtainable HAT is determined by TERPS.
3. The GQS is applicable to approach procedures providing vertical path guidance. It limits the magnitude of penetration of the obstruction clearance surfaces overlying the final approach course. The intent is to provide a descent path from DA to landing free of obstructions that could destabilize the established glidepath angle. The GQS is centered on a course from the DA point to the runway threshold. Its width is equal to the precision "W" surface at DA, and tapers uniformly to a width 100 feet from the runway edges. If the GQS is penetrated, vertical guidance instrument approach procedures (ILS/MLS/WAAS/LAAS/Baro-VNAV) are not authorized
4. The "W" surface is applicable to precision approach procedures. It is a sloping obstruction clearance surface (OCS) overlying the final approach course centerline. The surface slope varies with glidepath angle. The "W" surface must be clear to achieve lowest precision minimums. Surface slope varies with glide path angle, 102/angle; e.g., for optimum 3º glide path 34:1 surface must be clear.
5. If the W surface is penetrated, HAT and visibility will be increased as required by TERPS.
6. This is a new airport surface (see paragraph 306). .
7. An ALP is only required for airports in the NPIAS; it is recommended for all others**.**
8. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
9. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
10. To achieve lower visibility minimums based on credit for lighting, a TERPS specified approach light system is required.
11. Indicates what chart should be followed in the related chapters of this document.
12. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2), OFZ (reference paragraph 306) criteria, and TERPS Order paragraph 251 criteria.

Table A16-1B. Approach Procedure With Vertical Guidance (APV-RNP) Approach Requirements

Visibility Minimums[1]	< 3/4-statute mile	< 1-statute mile	1-statute mile	>1-statute mile[14]
Height Above Touchdown (HAT)[2]	250	300	350	400
TERPS Glidepath Qualification Surface (GQS)[3]	Table A2-1, Row 7, Criteria, and Appendix 2, par. 5a Clear			
TERPS Paragraph 251	34:1 clear	20:1 clear	20:1 clear, or penetrations lighted for night minimums (See AC 70/7460-1)	
Precision Obstacle Free Zone (POFZ) 200 x 800[4]	Required	Recommended		
Airport Layout Plan[5]	Required			
Minimum Runway Length	4,200 ft (1,280 m) (Paved)	3,200 ft (975 m)[6] (Paved)	3,200 ft (975 m)[6,7]	
Runway Markings (See AC 150/5340-1)	Nonprecision (Precision Recommended)		Nonprecision[7]	
Holding Position Signs & Markings (See AC 150/5340-1 and AC 150/5340-18)	Nonprecision *(Precision Recommended)*		Nonprecision[7]	
Runway Edge Lights[8]	HIRL / MIRL		MIRL/LIRL	
Parallel Taxiway [9]	Required		Recommended	
Approach Lights[10]	*Required*[11]		Recommended	
Runway Design Standards; e.g., Obstacle Free Zone (OFZ) [12]	APV OFZ Required			
Threshold Siting Criteria To Be Met [13]	Table A2-1, Row 4 and 9, Criteria		Appendix 2, Table A2-1, Lines 4 and 8, Criteria	
Survey Required for Lowest Minima (See Table 16-2)	Table A2-1, Row 6, Criteria			

1. Visibility minimums are subject to the application of FAA Order 8260.3 (TERPS) and associated orders or this table, whichever is higher.
2. The HAT indicated is for planning purposes only. Actual obtainable HAT is determined by TERPS.
3. The GQS is applicable to approach procedures providing vertical path guidance. It limits the magnitude of penetration of the obstruction clearance surfaces overlying the final approach course. The intent is to provide a descent path from DA to landing free of obstructions that could destabilize the established glidepath angle. The GQS is centered on a course from the DA point to the runway threshold. Its width is equal to the precision "W" surface at DA, and tapers uniformly to a width 100 feet from the runway edges. If the GQS is penetrated, vertical guidance instrument approach procedures (ILS/MLS/WAAS/LAAS/Baro-VNAV) are not authorized
4. This is a new airport surface (see paragraph 306)
5. An ALP is only required for obligated airports in the NPIAS; it is recommended for all others**.**
6. Runways less than 3,200 feet are protected by 14 CFR Part 77 to a lesser extent (77.23(a)(2) is not applicable for runways less than 3,200 feet). However runways as short as 2400 feet could support an instrument approach provided the lowest HAT is based on clearing any 200-foot obstacle within the final approach segment.
7. Unpaved runways require case-by-case evaluation by regional Flight Standards personnel.
8. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
9. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
10. To achieve lower visibility minimums based on credit for lighting, a TERPS specified approach light system is required.
11. ODALS, MALS, SSALS are acceptable. For LPV based minima approach lights are recommended not required.
12. Indicates what chart should be followed in the related chapters in this document.
13. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2), OFZ (reference paragraph 306) and TERPS paragraph 251 criteria.
14. For circling requirements, see Table 16-1C.

Table A16-1C. Nonprecision Approach Requirements

Visibility Minimums[1]	< 3/4-statute mile	< 1-statute mile	1-statute mile	>1-statute mile	Circling
Height Above Touchdown [2]	300	340	400	450	Varies
TERPS Paragraph 251	34:1 clear	20:1 clear	20:1 clear or penetrations lighted for night minimums (See AC 70/7460-1)		
Airport Layout Plan[4]	Required				Recommended
Minimum Runway Length	4,200 ft (1,280 m) (Paved)	3,200 ft (975 m)[5] (Paved)	3,200 ft (975 m)[5,6]		
Runway Markings (See AC 150/5340-1)	Precision	Nonprecision[6]			Visual (Basic)[6]
Holding Position Signs & Markings (See AC 150/5340-1 and AC 150/5340-18)	Precision	Nonprecision			Visual (Basic)[6]
Runway Edge Lights[7]	HIRL / MIRL		MIRL / LIRL		MIRL / LIRL (Required only for night minima)
Parallel Taxiway [8]	Required		Recommended		
Approach Lights[9]	MALSR, SSALR, or ALSF Required	Required [10]	Recommended[10]		Not Required
Runway Design Standards, e.g. Obstacle Free Zone (OFZ)[11]	<3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums			Not Required
Threshold Siting Criteria To Be Met [12]	Table A2-1, Row 9, Criteria	Table A2-1, Row 8, Criteria	Table A2-1, Row 1–5, Criteria		Table A2-1, Row 1–2, Criteria
Survey Required for Lowest Minima (See Table A16-2)	Table A2-1, Row 5, Criteria	Table A2-1, Row 4, Criteria	Table A2-1, Row 3, Criteria		Table A2-1, Row 1,2,3, Criteria

1. Visibility minimums are subject to the application of FAA Order 8260.3 (TERPS) and associated orders or this table, whichever is higher
2. The Height Above Touchdown (HAT) indicated is for planning purposes only. Actual obtainable HAT is determined by TERPS.
3. This is a new airport surface (see paragraph 306).
4. An ALP is only required for obligated airports in the NPIAS; it is recommended for all others**.**
5. Runways less than 3,200 feet are protected by 14 CFR Part 77 to a lesser extent. However runways as short as 2400 feet could support an instrument approach provided the lowest HAT is based on clearing any 200-foot obstacle within the final approach segment.
6. Unpaved runways require case-by-case evaluation by regional Flight Standards personnel.
7. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
8. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
9. To achieve lower visibility minimums based on credit for lighting, a TERPS specified approach lighting system is required.
10. ODALS, MALS, SSALS, SALS are acceptable.
11. Indicates what chart should be followed in the related chapters in this document.
12. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2), OFZ (reference paragraph 306), and TERPS Order, 8260.3 paragraph 251, criteria.

Table A16-2. Survey Requirements for Instrument Approach Procedures:

The Table indicates the acceptable runway obstruction survey needed to support an instrument approach procedure.

		Runway Survey Type								
	Approach	None	AV	BV	ANP	C	SUPLC	D	ANAPC	PIR
1	Night Circling			X	X	X	X	X	X	X
2	Non-Precision Approach ≥ 1SM, Day Only	X	X	X	X	X	X	X	X	X
3	Non-Precision Approach ≥ 1SM				X	X	X	X	X	X
4	Non-Precision Approach < 1SM					X	X	X	X	X
5	Non-Precision Approach < ¾ SM								X	X
6	NPV Approach ≥ ¾ SM							X	X	X
7	NPV Approach < ¾ SM								X	X
8	Precision CAT I Approach < 1SM							X	X	X
9	Precision CAT I Approach < ¾ SM								X	X
10	Precision CAT II Approach									X
11	Precision CAT III Approach									X

Note:
An "X" in each column for a given Approach (1 through 11) denotes a survey that is acceptable to support that approach. As shown, multiple surveys may support the approach, however the "X" farthest to the left indicates the minimum survey needed.

Runway survey types from FAA No. 405, Standards for Aeronautical Surveys and Related Products:

AV - FAR77 Visual Approach - Utility runway, includes approach and primary surfaces only.
BV - FAR77 Visual Approach, includes approach and primary surfaces only.
ANP - FAR77 Nonprecision Approach - Utility runway, includes approach and primary surfaces only.
C - FAR77 Nonprecision Approach - Visibility minimums greater than 3/4 mile includes approach and primary surfaces only.
SUPLC - C Approach underlying a BV approach, includes approach and primary surfaces only.
D - FAR77 Nonprecision Approach - Visibility minimums as low as 3/4 mile includes approach and primary surfaces only.
ANAPC - Area Navigation Approach - Precision, conventional landing, includes approach, primary, transition, and missed approach surfaces.
PIR - FAR77 Precision Instrument Approach, includes approach and primary surfaces only.

Appendix 17. MINIMUM DISTANCES BETWEEN CERTAIN AIRPORT FEATURES AND ANY ON-AIRPORT AGRICULTURE CROPS

Table A17-1. Minimum Distances Between Certain Airport Features and Any On-Airport Agriculture Crops.

Aircraft Approach Category and Design Group [1]	Distance in Feet From Runway Centerline to Crop		Distance in Feet From Runway End to Crop		Distance in Feet from Centerline of Taxiway to Crop	Distance in Feet from Edge of Apron to Crop
	Visual & ≥ ¾ mile	< ¾ mile	Visual & ≥ ¾ mile	< ¾ mile		
Category A & B Aircraft						
Group I	200 [2]	400	300[3]	600	45	40
Group II	250	400	400[3]	600	66	53
Group III	400	400	600	800	93	31
Group IV	400	400	1,000	1,000	130	113
Category C, D, & E Aircraft						
Group I	530 [3]	575 [3]	1,000	1,000	45	40
Group II	530 [3]	575 [3]	1,000	1,000	66	53
Group III	530 [3]	575 [3]	1,000	1,000	93	31
Group IV	530 [3]	575 [3]	1,000	1,000	130	113
Group V	530 [3]	575 [3]	1,000	1,000	160	133
Group VI	530 [3]	575 [3]	1,000	1,000	193	167

1. Design Groups are based on wing span, and Category depends on approach speed of the aircraft as shown below:

Design Group	**Category**
Group I: Wing span up to 49 ft.	Category A: Speed less than 91 knots
Group II Wing span 49 ft. up to 73 ft.	Category B: Speed 91 knots up to 120 knots
Group III: Wing span 79 ft. up to 117 ft.	Category C: Speed 121 knots up to 140 knots
Group IV: Wing span 113 ft. up to 170 ft.	Category D: Speed 141 knots up to 165 knots
Group V: Wing span 171 ft. up to 213 ft.	Category E: Speed 166 knots or more
Group VI: Wing span 214 ft. up to 261 ft.	

2. If the runway will only serve small airplanes (12,500 lb. and under) in Design Group I, this dimension may be reduced to 125 feet; however, this dimension should be increased where necessary to accommodate visual navigational aids that may be installed. For example farming operations should not be allowed within 25 feet of a Precision Approach Path Indicator (PAPI) light box.

3. These dimensions reflect the TSS as defined in AC 150/5300-13, Appendix 2. The TSS cannot be penetrated by any object. Under these conditions, the TSS is more restrictive than the OFA, and the dimensions shown here are to prevent penetration of the TSS by crops and farm machinery.

Appendix 18. ACRONYMS

The acronyms presented herein are intended for use with this publication only.

AAA	Airport Airspace Analysis
AC	Advisory Circular
AD	Airport Design
AFD	Airport Facility Directory
ADG	Airplane Design Group
AIP	Airport Improvement Program or Aeronautical Information Publication
ALP	Airport Layout Plan
ALS	Approach Lighting System
ALSF(-1, -2)	Approach Lighting System with Sequenced Flashers
APV	Approach Procedure with Vertical Guidance
ARC	Airport Reference Code
ARP	Airport Reference Point
ASDA	Accelerate-Stop Distance Available
ASDE	Airport Surface Detection Equipment
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATCT	Airport Traffic Control Tower
AWOS	Automated Weather Observing System
AZ	Azimuth
BRL	Building Restriction Line
CAT	Category
CFR	Code of Federal Regulation
CFW	Center Field Wind
CWY	Clearway
DA	Decision Altitude
DME	Distance Measuring Equipment
DXF	AutoCAD Drawing Interchange file format
EDS	Environmental Data Service
EL	Elevation
FBO	Fixed Base Operator
GPS	Global Positioning System
GQS	Glidepath Qualification Surface
GS	Glide Slope
GVGI	Generic Visual Slope Indicator
HAT	Height Above Touchdown
HIRL	High Intensity Runway Lights
IFR	Instrument Flight Rules
IGES	Initial Graphics Exchange Specification file format
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
LAAS	Local Area Augmentation System
LDA	Landing Distance Available or Localizer Type Directional Aid
LDIN	Lead-In Lights
LIRS	Low Impact Resistant Supports
LNAV	Lateral Navigation
LOC	Localizer
MALS	Medium Intensity Approach Lighting System
MALSF	Medium Intensity Approach Lighting System with Sequenced Flashers
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL	Medium Intensity Runway Lights
MLS	Microwave Landing System
MM	Middle Marker
MSL	Mean Sea Level
NAVAID	Navigational Aid
NCDC	National Climatic Data Center
NDB	Nondirectional Beacon
NP	Mon-Precision (Markings
NPIAS	National Plan of Integrated Airport Systems
NTIS	National Technical Information Service
ODALS	Omnidirectional Approach Lighting System
OFA	Object Free Area
OFZ	Obstacle Free Zone
OM	Outer Marker
NPA	Non-Precision Approach
P	Precision (Markings)
PA	Precision Approach
PAPI	Precision Approach Path Indicator
POFA	Precision Object Free Area
RAIL	Runway Alignment Indicator Lights
REIL	Runway End Identifier Lights
RNAV	Area Navigation
ROFA	Runway Object Free Area
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RVR	Runway Visual Range
RW	Runway
SALS	Short Approach Lighting System
SSALR	Short Simplified Approach Lighting System with Runway Alignment Indicator Lights
SSALS	Simplified Short Approach Lighting System
SWY	Stopway
TERPS	FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures*
TH	Threshold
TL	Taxilane
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
TSA	Taxiway Safety Area
TVOR	Very High Frequency Omnirange located on an airport
TW	Taxiway
USGS	United States Geological Service
V	Visual (Markings)
V_1	Takeoff decision speed
V_2	Takeoff safety speed
VFR	Visual Flight Rules
V_{LOF}	Lift-off speed

V_{SO}	Stalling speed or the minimum steady flight speed in the landing configuration	VOR	Very High Frequency Omnirange
VNAV	Vertical Navigation	WAAS	Wide Area Augmentation System

Appendix 19. INDEX